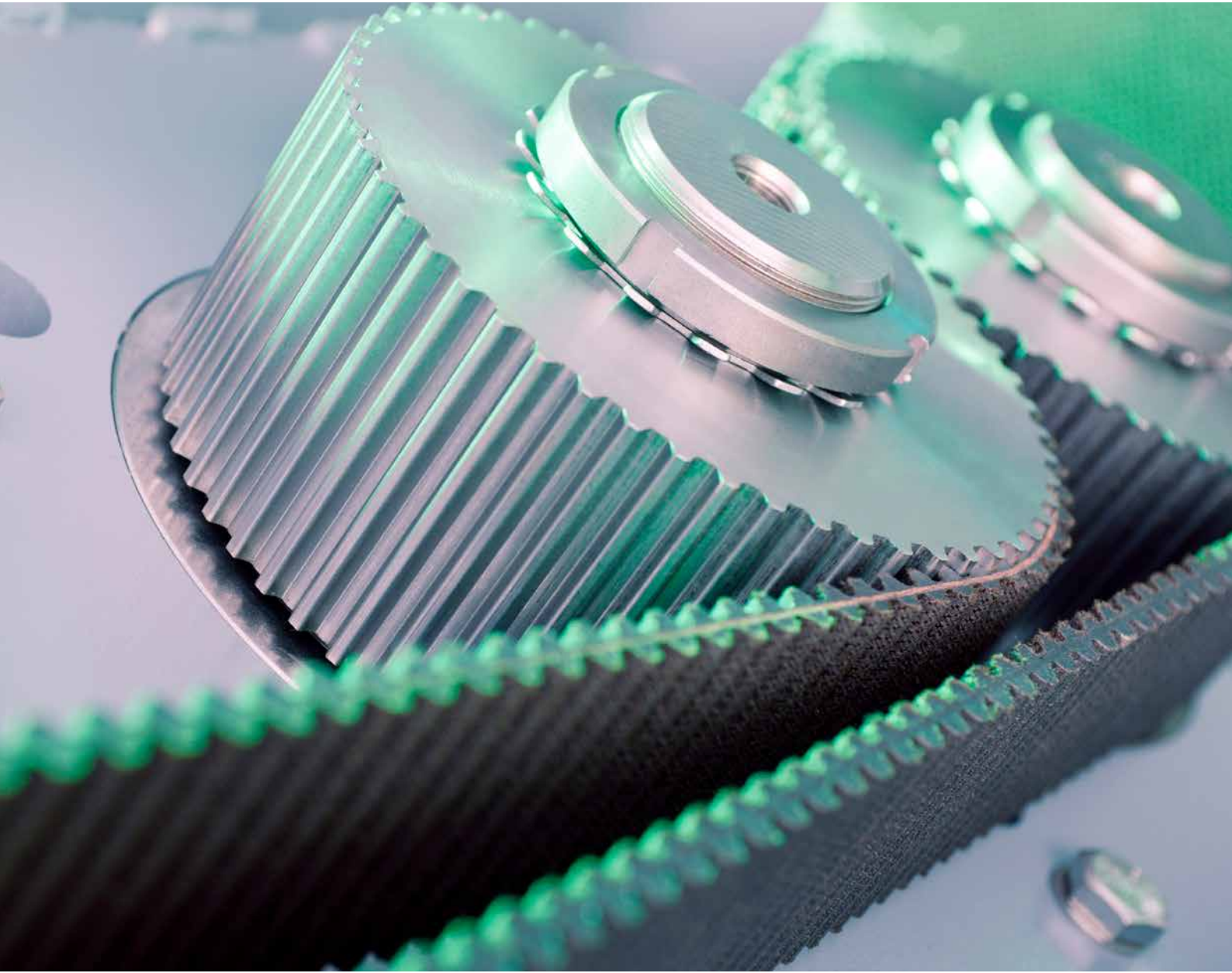


NETZSCH

Proven Excellence.



TORNADO® Rotary Lobe Pumps

The service-friendly rotary lobe pump, constructed according to the principle "full service in place"

Pumps & Systems

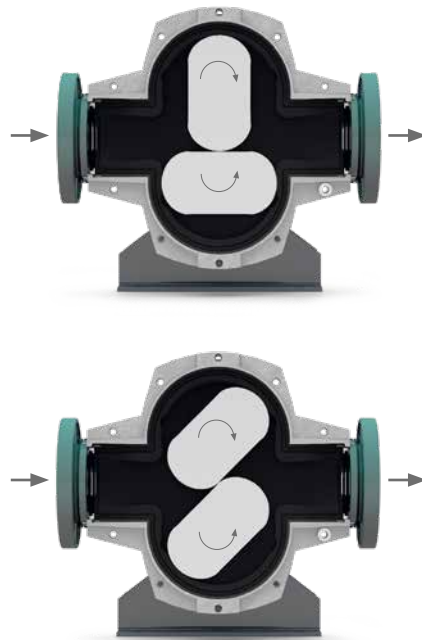
TORNADO®

MAXIMUM SERVICE FRIENDLINESS MEETS HIGH PERFORMANCE

NETZSCH TORNADO® self-priming, valveless, positive displacement pumps can be optimally customised to meet specific process and application requirements. They can be used for almost any media on intermittent, continuous or dosing applications.

TORNADO® pumps are particularly service and maintenance friendly; all parts that come into contact with the media are directly accessible without dismantling the pipework or disconnecting the drive. Their advantages are small space requirements due to their compact design, high performance and maximised operational reliability, and the physical separation between the pump head and bearing housing.





Functioning principle

The TORNADO® rotary lobe pump is a positive displacement pump. The pumping action is generated by the contra-rotation of two rotors within the pump chamber which are synchronised externally. The media enters the pump chamber through the inlet port and is carried around the chamber by the rotors to the outlet port where it is discharged.

Characteristics

- Valve free construction
- Self priming
- Suitable for any kind of liquid including media containing gas, solids or fibrous matter
- Suitable for lubricating and non lubricating media
- Pumping media with high or low viscosity
- Handling shear sensitive fluids
- Operating at temperature up to 100°C
- Reversible operation
- Can be serviced without disconnecting pipework
- Tolerance of dry running

The newly developed TORNADO® T2

REVOLUTIONARY IN DESIGN AND CUSTOMER BENEFIT

PROCESS OPTIMISATION

COMPACTNESS

RELIABLE

OPERATIONAL SAFETY

COST-EFFECTIVENESS

EASE OF SERVICE

MAINTENANCE-FREE



Reliability

"The best maintenance is no maintenance"

We have perfected the rotary lobe pump concept by incorporating the tried, tested and proven NETZSCH core competence in the design and manufacture of engineered rubber solutions for the new TORNADO® T2. During the entire pumping cycle only elastomer and metal component surfaces interface within the pump; elastomer to elastomer component surface interfaces, which suffer from excess wear and generate heat, are completely eliminated. Having these dissimilar materials for the static and dynamic pump head components, the elastomeric surfaces are subjected to a lower dynamic loading resulting in less plastic deformation and stress which in turn reduces wear and extends operational life. The use of high quality sealed for life bearings, selected for their load carrying characteristics and long life, combined with the tooth belt drive result in a drive train that can be considered maintenance-free.

Ease of service

"Full Service In Place instead of Maintenance In Place"

The innovative design of the TORNADO® T2 provides quick and easy access to the pump chamber, including the inlet and outlet ports, by simply removing the cover plate. This provides improved access for inspection, cleaning, service and replacing parts.

Compactness

"Efficiency in the smallest space"

The innovative design concept of incorporating a timing belt to synchronise and drive the pump means reduced space. The smaller overall dimensions and maintenance in place represent a cost saving in terms of site utilisation.

Leakage protection

"From GSS¹ to BSS²"

The proven physical separation between pump chamber and bearing housing (GSS) guarantees absolute operational safety (BSS).

¹ GSS = Gearbox Security System

² BSS = Bearing Security System

Environmental awareness

"Green is already our corporate colour"

The weight of the TORNADO® T2 has been significantly reduced through the choice of materials and innovative component design. This also means the pump consumes less energy. The reduced power requirement, in parallel with increased pump performance, lowers power consumption and so preserves our environment in a sustainable way. By eliminating the need for oil NETZSCH demonstrate their environmental awareness.

Cost-effectiveness

"Saves resources and saves money"

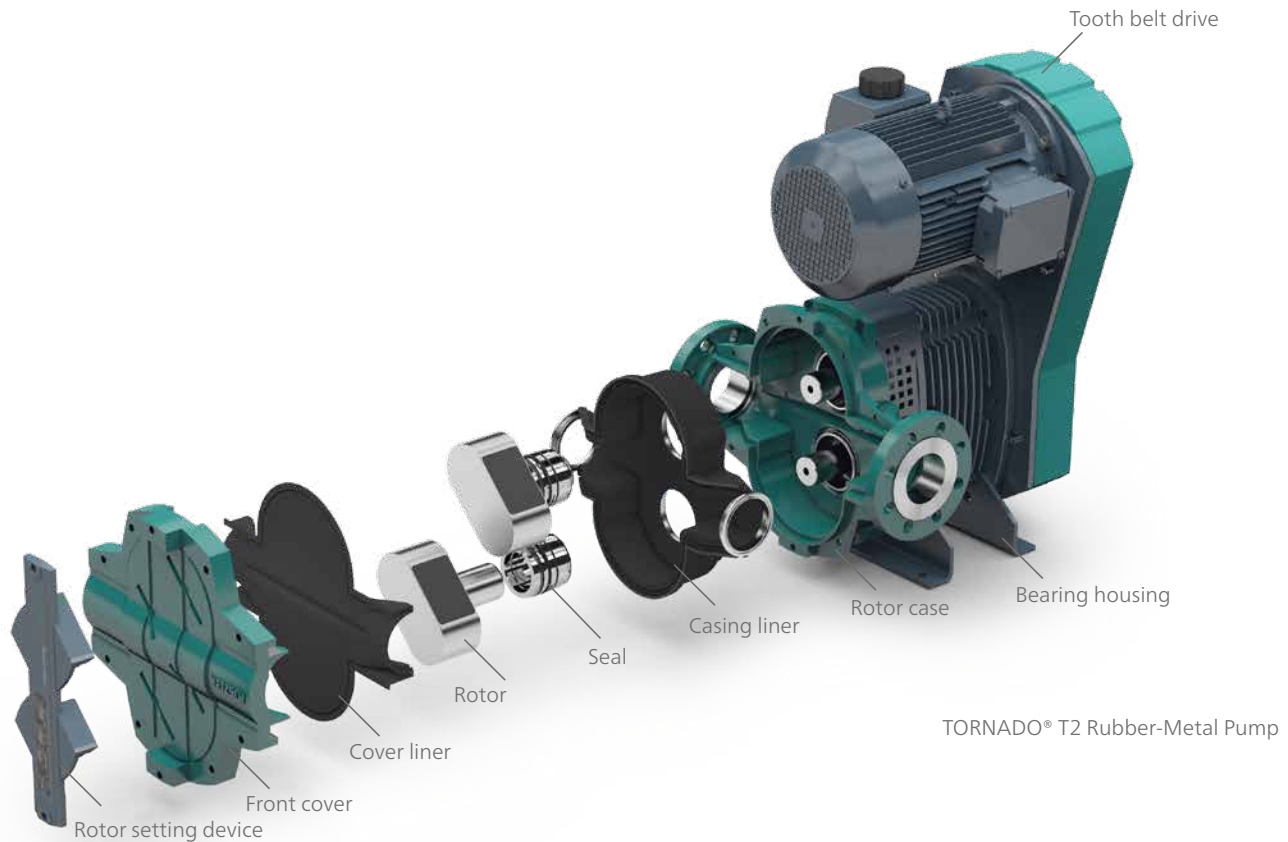
The revolutionary design of the TORNADO® T2 pump head extends the lifetime and improves the performance of the rotors, the elastomer liners and the mechanical seals. By adopting a modular design approach it reduces the cost of wearing parts extending operating life and significantly reducing the life cycle costs (LCC).

Drive options

A range of drive options are available to suit specific application and process requirements. For more information see page 9.

Optimum choice of material

YOUR APPLICATION IS THE DECISIVE FACTOR

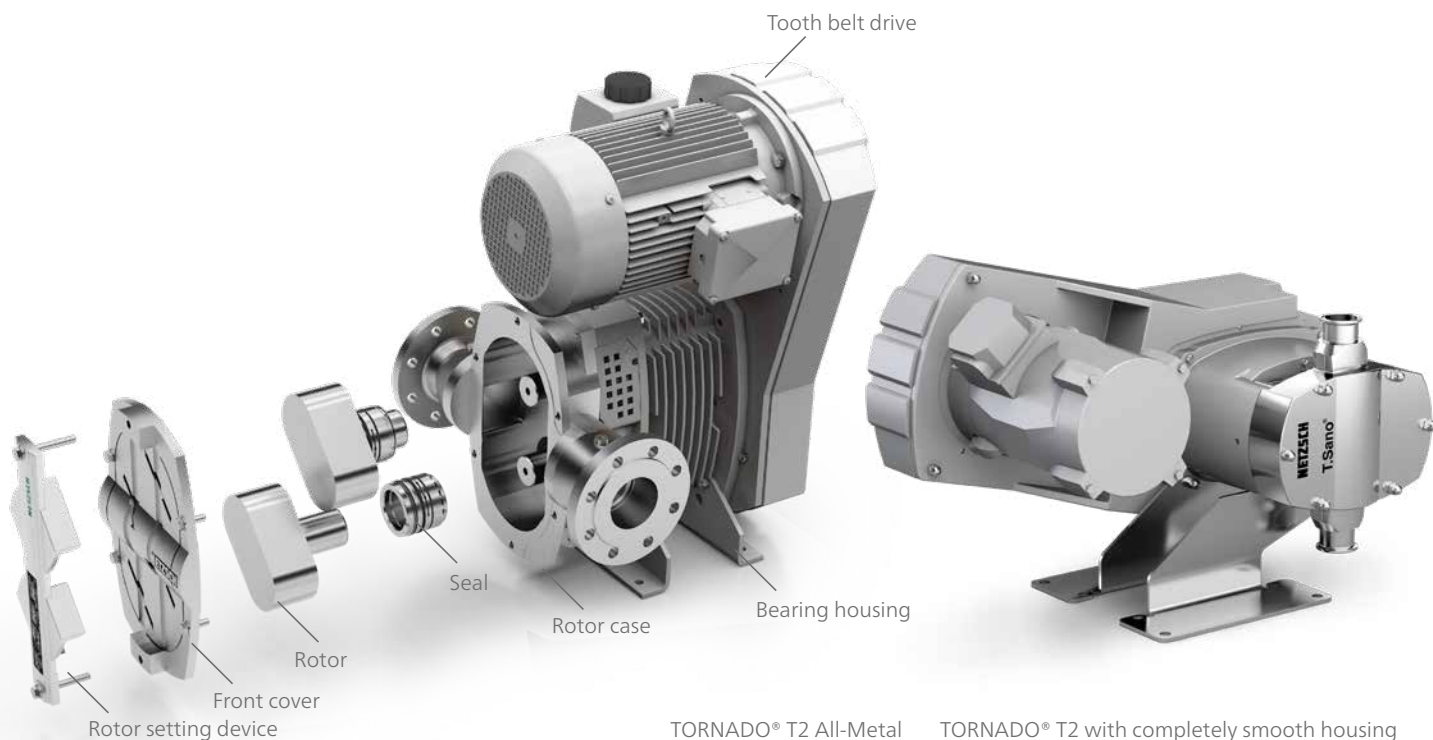


Stability

"The best maintenance is no maintenance"

Plastic deformation and heat generation is reduced by maintaining a uniform elastomeric wall thickness within the pump chamber. Material sections, bearing selection and seal positioning combine to minimize the adverse effects on dimensional changes to pump head geometry due to temperature changes. The design and geometry of the rotors ensures a high level of durability. With the rotor fixing and drive outside of the pump chamber the rotors can have a completely flat continuous front and back face with no dead areas which eliminates the possibility of fibrous

material becoming trapped and compacted. The mechanical seal design and seal face position eliminates dead areas and allows constant circulation of the media around the faces which ensures that the risk of media entrapment and compaction is minimised. The TORNADO® T2 all metal pumps can be manufactured from metals offering higher levels of cleanliness, corrosion or abrasion resistance and can therefore be applied to applications demanding the characteristics of these materials, especially in the low sanitary hygienic or chemical market sectors.



TORNADO® T2 All-Metal

TORNADO® T2 with completely smooth housing

Ease of service

“Full Service In Place instead of Maintenance In Place”

Servicing a rotary lobe pump has never been so easy and all without the need for any special tools. The rotors can be removed and replaced very easily and quickly because they are not bolted or keyed to the shafts within the pump head but fixed with quick-fit non media wetted taper lock assemblies positioned and accessed outside of the pump head. The geometry of the rotors means that they can be fitted and removed independently. There are no keys dictating a unique rotor position which results in faster, easier and cleaner rotor removal and replacement and for rotor

synchronisation a setting device is included as an integral part of the pump front cover. Benefitting from all these features the service time for the TORNADO® T2 has been reduced to significantly less than half the time required for servicing a conventional rotary lobe pump. The pre-set cartridge mechanical seals are fitted directly into the rotor and mounted on the shafts as one assembly. There are various cartridge mechanical seals available all of which fit into a common housing allowing for seal upgrades without modification: “Plug and Play”.

Process optimisation

“Maximum reliability through design, material and range of mechanical seals”

The revolutionary NETZSCH PRS (Pulsation Reduction System) guarantees an almost pulsation-free discharge that is of benefit in many process applications. Even when used in conjunction with straight bi-lobe rotors, which ensures better solid handling capability and easier maintenance, the NETZSCH PRS provides an almost pulsation-free flow which outperforms the characteristics of complex multi-lobe helical rotors. The pump chamber and mechanical seal design and position eliminates dead areas, where pump media can collect and compact, making cleaning easier, either manually or by CIP.

Surprisingly simple

THE OIL-FREE SYNCHRONISATION WITH A TOOTH BELT DRIVE



Single tooth belt drive

Functioning principle

The drive motor transmits power via a double-sided tooth belt which both drives and synchronises the pump shafts. If required, the drive can be used in conjunction with a frequency converter to achieve a specific flowrate or range of flowrates.

Operational safe and oil free

“A new application of tried and tested drive technology”

An accident causing a complete write-off is inconceivable with this pump. We have replaced the timing gears which have to operate in a managed, maintained environment, with a robust and durable synchronising tooth belt drive. This gives smoothness of operation, load dampening, reduced energy loss and eliminates the need for oil. No more oil filling, draining, changing, leakages, spillage or disposal reduces down time and increases operation time and provides a cleaner, safer working environment. The simple design reduces down-time for service; the result is that the pump is back on stream in less time.

Environmental awareness

“TORNADO® T2 – the environment friendly pump”

By incorporating a tooth belt drive the pump does not use any oil. There is no chance of any environmental pollution due to spillage or leakage. Our customers benefit from low noise levels and reduced heat in the working area around the pump which corresponds with less energy loss.

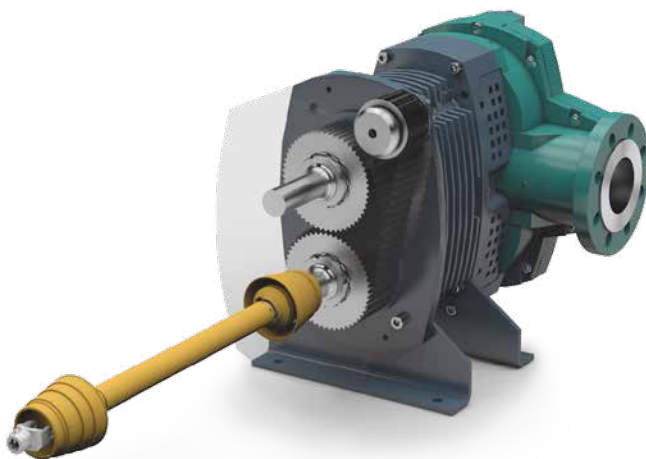


Versatile combination –
flexible installation –
consistent pumping capacity

Both single and double tooth belt drive arrangements are available providing a wide range of speed reduction ratios.



If required a shaft extension for direct in line coupling to electric motor or diesel engine drive is available.



Power take off (PTO) shaft extension for drive from truck or tractor; twin shaft extensions available where reversible operation is required.

Optimum operation

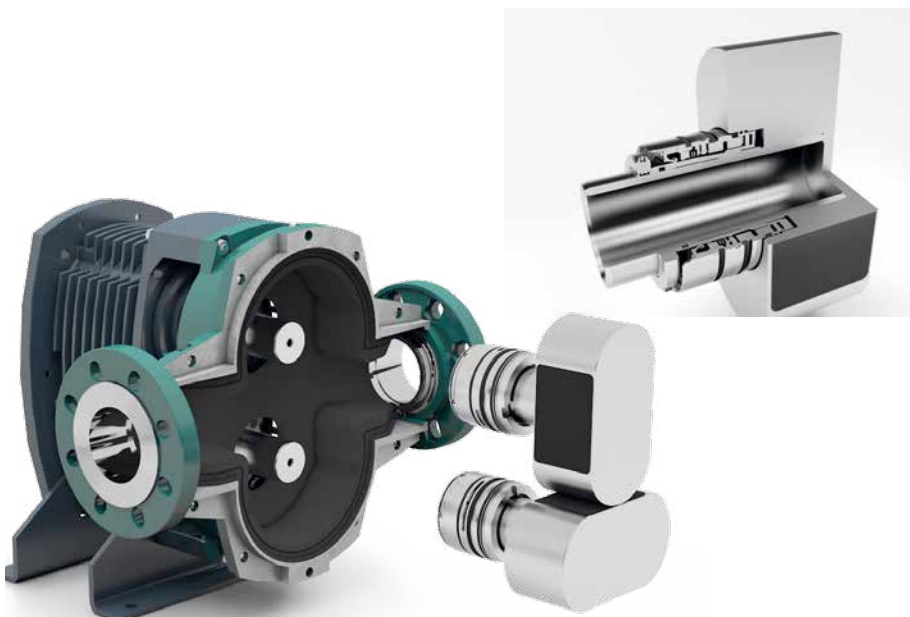
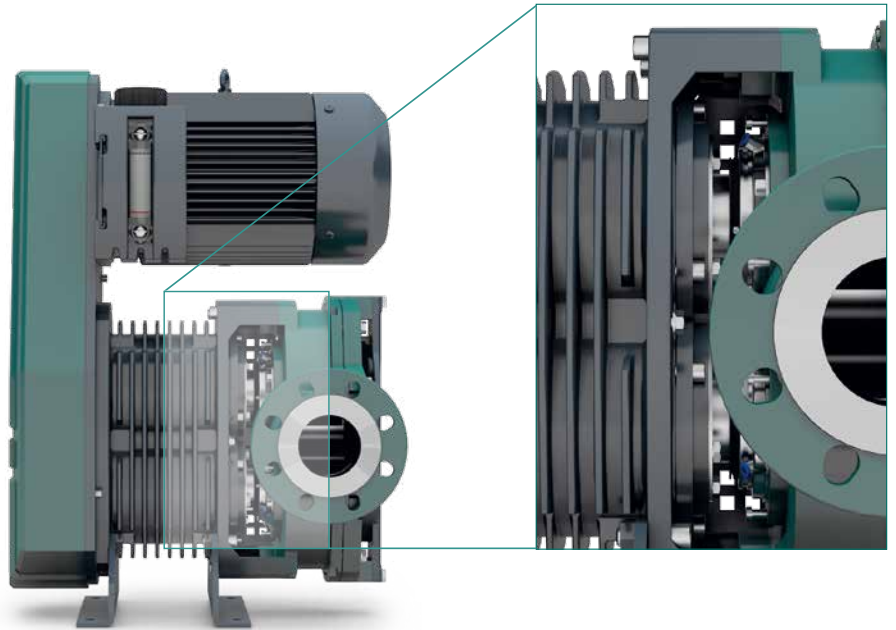
AND PROCESS RELIABILITY AND SAFETY

From GSS¹ to BSS²

- No ingress of the media into the bearing housing in the event of seal failure
- Easy access to seal buffer/quench and barrier/flush connections
- Visual indicator of seal performance

¹ GSS = Gearbox Security System

² BSS = Bearing Security System



Design and position of mechanical seal: cartridge unit integral with rotor

- Uninterrupted and direct flow of media to and around seal faces
- Self draining, no dead areas
- No wear of shafts, since seals are designed as robust cartridge
- Easy assembly and disassembly

Mechanical seal selection for TORNADO® T2

A pump is only as reliable as its seals. Therefore a range of seals and seal materials are available for the new TORNADO® T2. All seals are of a cartridge design and fit into a common housing allowing for seal upgrades without modification. The seals are positioned with the seal faces directly in the flowpath through the pump chamber.

Mechanical seal typically used for agricultural and environmental applications



Single for steel surfaces

Mechanical seal typically used for industrial and general process applications



Single for SIC or other materials



Single for buffer or quench



Double for barrier or flush

The conventional TORNADO® T1

WITH ITS PROVEN QUALITY

For more than 20 years we have been supplying the classic design NETZSCH TORNADO® T1 rotary lobe pumps. Their extensive use in applications in the Environmental and Energy, Chemical, Pulp and Paper and Oil and Gas sectors for flow rates up to 1000 m³/h demonstrate their high performance. Pump size and specification are precisely tailored to suit the characteristics of the pumped media and the operating requirements. Three series with 12 models available provide for flow rates up to 1,000 m³/h at discharge pressures up to 6 bar for both intermittent and continuous operation. For higher discharge pressures customised solutions are available.

Your benefits

- GSS¹ technology for long term reliability
- Maintenance without the need to disconnect the inlet and outlet pipework
- Easy and quick access to the lobes and shaft seals
- Tolerance of running dry

¹ Gearbox Security System



Series TORNADO® XLB

Series TORNADO® XB

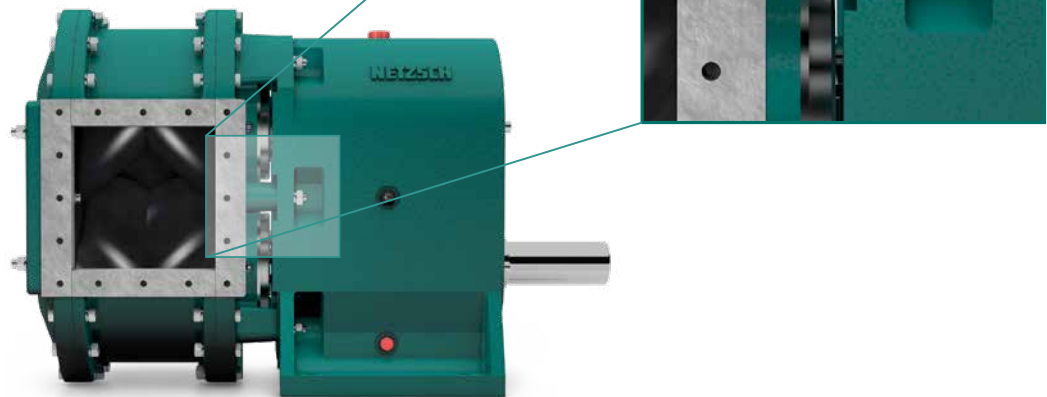
Series TORNADO® MB

NETZSCH GSS technology (GSS = Gearbox Security System) – Long-term reliability

The classic TORNADO® T1 rotary lobe pump is of optimal design for each application based on the knowledge and experience gained by NETZSCH over many decades of development, design, manufacture and supply of positive displacement pumps into all industries. This experience has founded the development of the NETZSCH GSS technology (Gearbox Security System), which significantly extends operational reliability by physically separating the pump chamber and gearbox.

Your benefits

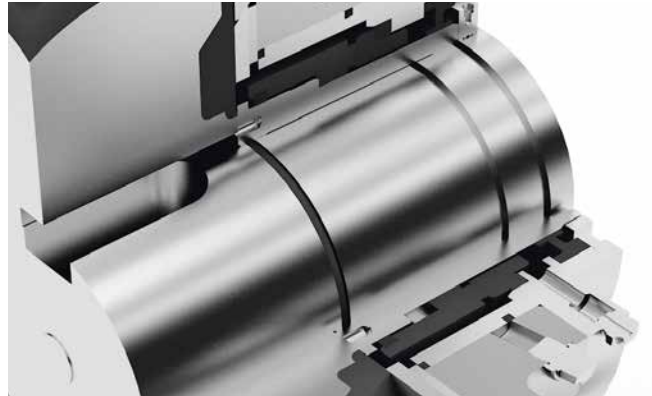
- Extended operational reliability
- No ingress of the pumped media into the pump gearbox in the event of a product leaking
- No ingress of pump gearbox oil into the pump chamber
- Easy access to the shaft seal flushing connections



Seals are critical to satisfactory pump performance and the TORNADO® T1 is available with a range of highly engineered sealing solutions designed and selected to extend pump operating life.



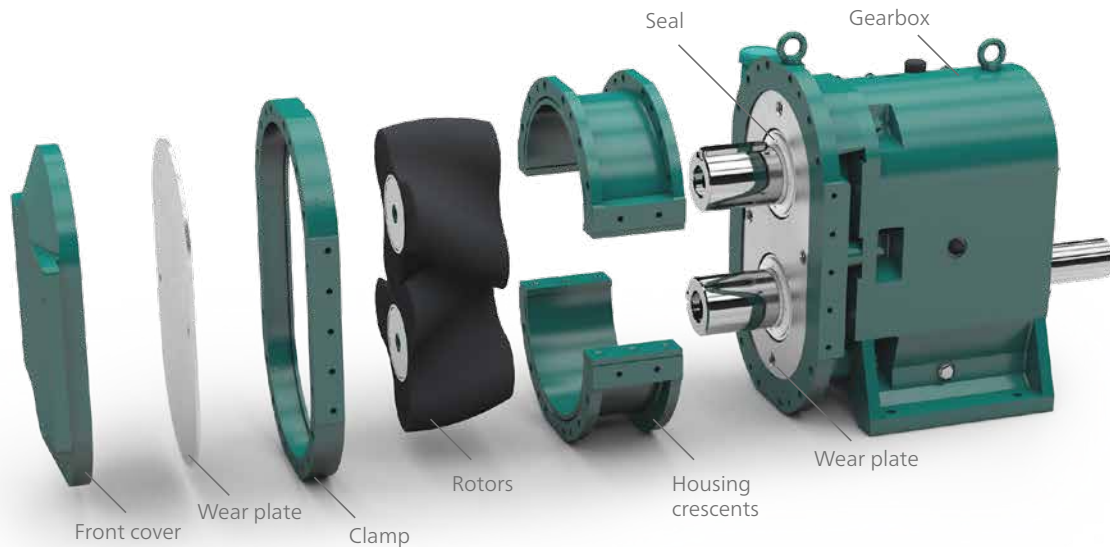
Classic single acting seal



Single and double for buffer or quench for industrial

The classic TORNADO® T1

THE DESIGN



Front Cover

Rotors, cover seal and product seals can be accessed for inspection, service or replacement by simply removing the front cover. Disassembly of the inlet and outlet pipework and pump housing is not necessary.

Wear Plates

Abrasion and chemically resistant, replaceable wear plates are fitted both sides of the rotors.

Rotors

Straight sided or helical rotors are selected to suit individual application requirements. Rotors are available as bi-lobe, tri-lobe or four-lobe and a wide range of materials is available.

Housing Crescents

Modular construction allows for the crescents to be simply replaced should wear occur. Pump life time can be further extended with the option of replaceable crescent liners.

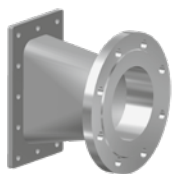
Seals

Wide range of product seals and materials are available, which are selected to suit individual application requirements. Seal arrangements include easy access connections for seal quench or flush.

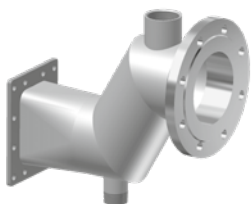
Gearbox

The patented gearbox design includes NETZSCH GSS-Technology separating the pump head from the gear box which eliminates cross contamination between the pump media and gear box lubricant.

Pump inlet and outlet adaptors for connection to installation pipework are available in various designs



Straight adaptor



S-shaped adaptor



Elbow (90° upwards) adaptor

Connection options

Adaptors designed to suit specific installations available on request

The rotors – low-pulsation, smooth pumping of all media

Rotors in different geometries and materials



2 lobe straight



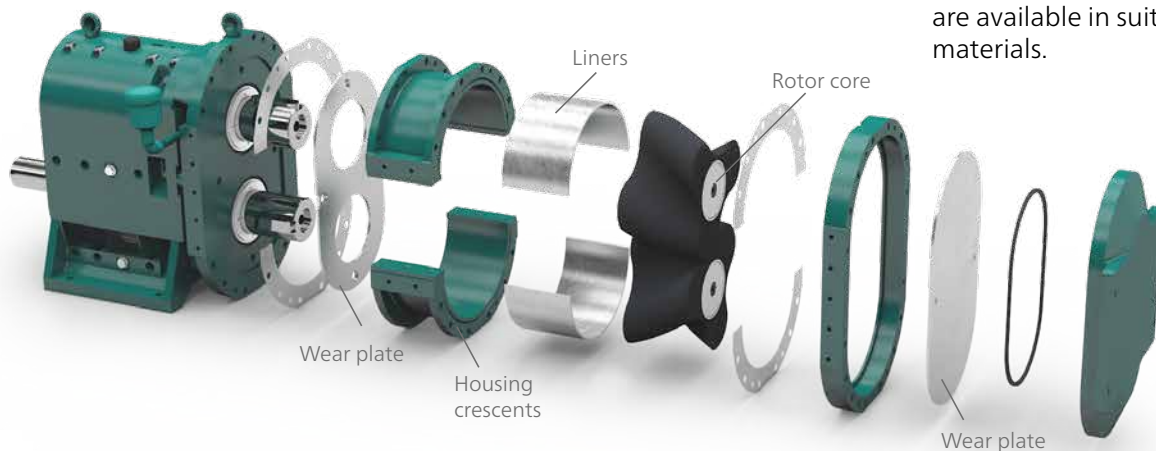
3 lobe helical



4 lobe helical

The rotor geometry and material are selected for the characteristics of the pumped media. Geometries are available for products which are viscous, abrasive or contain solids. Materials tailored to the media characteristics increase the durability of the rotors and extend service life.

Range of pump head wetted materials broadens application coverage



For handling chemically corrosive or otherwise aggressive media the TORNADO® T1 pump housing, wear plates, liners and rotor cores are available in suitably resistant materials.

It's the combination that counts

The ideal pump for your application, available with the accessories that protect your process: Accessories to increase the operational safety of both pump and plant and to prevent downtimes

Dry running protector

The dry running protection units (STP2A, STP2D) for use with the Tornado rotary lobe pumps operate by monitoring the temperature between rotor and rotor case during normal operation. Should the operating temperature rise over a predetermined set point due to an increase in friction caused by dry running the unit will shut down the pump, thus preventing any damage to the rotor case liner and rotor. The unit controller can be set for two different switch temperatures, for example the first set temperature could be used for the normally pumped media and the second for a different media temperature, for example for a cleaning fluid process.



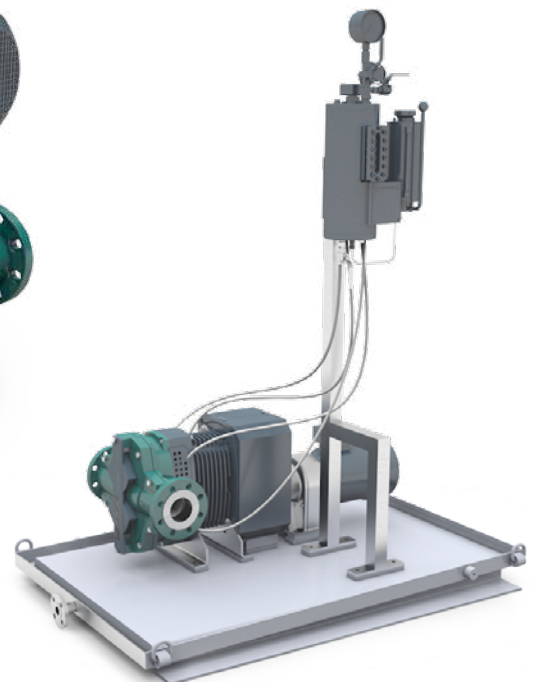
Quench pot for single mechanical seals

A quench pot is necessary when the shaft seals need to be operated with a quench, but it is not required that the seal is continuously flushed. The provision of a quench pot would be recommended to prevent dry running of the seals or crystallisation of the pumped media.



Pressurised flush for double mechanical seals

A double mechanical seal must be used in conjunction with a system providing a pressurised flush or thermo-syphon system. The pressurised flush is required to lubricate the seals, cool the seals and seal area and flush contaminants from the seal chamber. The flush liquid should be compatible with the pumped media, lubricating and have a high specific heat capacity. The pressure of the flush should be 2 bar above the pressure acting on the inboard seal from the pump chamber and flow rate of the flush must also be controlled.

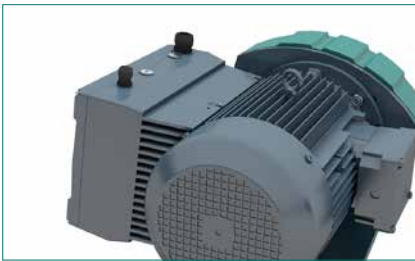


Further accessories

available on request

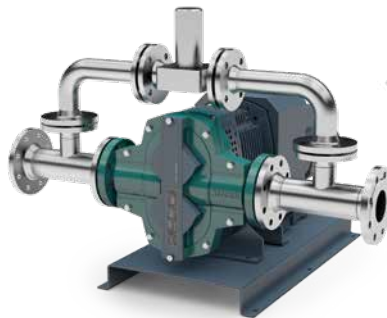
Frequency converter

For varying speed and flowrates a frequency converter is available.



Over pressure protection

Bypass line with relief valve for over pressure protection.



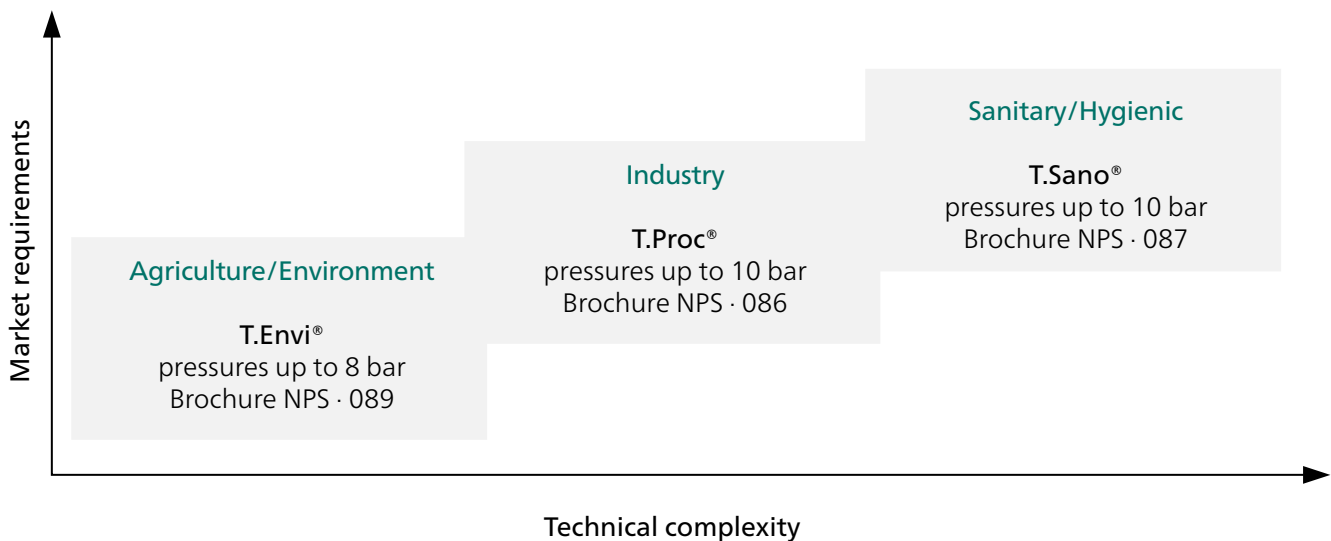
Mobile Versions

TORNADO® units used with various drives are also used for mobile versions.



Our product philosophy – your benefit: the best pump for your application

The TORNADO® rotary lobe pump is available in three series with each series offering features and specifications meeting specific market needs.



TORNADO® T.Envi®

THE ROBUST PUMP FOR AGRICULTURE AND

NETZSCH TORNADO® Rotary Lobe Pumps T.Envi® – Operating Parameters

Range	Model		Flowrate at nominal speed range (theoretical)**	Speed (nominal) recommended range	Flowrate at max. speed (theoretical)**	Speed max.	Discharge pressure (max.) continuous/intermittent	
			appr. m³/h	rpm	m³/h	rpm	bar	
T1	MB-1		3 to 14	100 to 500	23	800	6/8	
T1	MB-2		4 to 20	100 to 500	32	800	6/8	
T2	04/45	08/45	8 to 39	100 to 500	45	600	4/6	8/10
T2	03/70	06/70	12 to 58	100 to 500	70	600	3/5	6/8
T2	04/100	08/100	16 to 82	100 to 500	100	600	4/6	8/10
T2	03/140	06/140	24 to 119	100 to 500	140	600	3/5	6/8
T2	08/200		41 to 161	100 to 500	200	600	8	
T2	06/300		60 to 226	100 to 500	300	600	6	
T1	XLB-2		30 to 151	100 to 500	166	550	4/6	
T2	04/200	08/200	41 to 161	100 to 500	200	600	4/6	8/10
T1	XLB-3		43 to 214	100 to 500	235	550	4/6	
T2	03/300	06/300	50 bis 240	100 to 500	270	550	3/5	6/8
T1	XLB-4		60 to 302	100 to 500	332	550	4/6	
T1	XLB-6/2		121 to 604	100 to 500	604	500	4/5	
T1	XLB-8/2		181 to 905	100 to 500	905	500	3/5	

* Temperature, depending on elastomer: 100° C, custom-made: 140° C

** Each flow rate can generally be covered with the conventional TORNADO® T1, too.

ENVIRONMENTAL TECHNOLOGY

			Advantages
Displacement (theoretical)	Flange connections	Pump head materials (wetted)	<ul style="list-style-type: none"> ▪ Oil-free tooth belt drive ▪ no dead areas, lobes attached outside the pump chamber ▪ lobe changing takes place in 1/4 of the usual service time ▪ Pulsation-free housing construction ▪ solids-laden media will be conveyed easily ▪ Also in mobile version available with/without heated front cover ▪ The design is made according to customer request
l/r	mm/ANSI	material	
0,47	65/2,5"	metal/elastomere*	
0,67	80/3"	metal/elastomere*	
1,27	80/3"	metal/elastomere*	
1,90	100/4"	metal/elastomere*	
2,74	125/5"	metal/elastomere*	
3,95	125/5"	metal/elastomere*	
5,72	150/6"	metal/elastomere*	
7,95	200/8"	metal/elastomere*	
5,03	150/6"	metal/elastomere*	
5,7	150/6"	metal/elastomere*	
7,12	150/6"	metal/elastomere*	
7,95	200/8"	metal/elastomere*	
10,06	200/8"	metal/elastomere*	
20,12	250/10"	metal/elastomere*	
30,18	250/10"	metal/elastomere*	

TORNADO® T.Proc®

MAXIMUM VERSIONS FOR THE

NETZSCH TORNADO® Rotary Lobe Pumps T.Proc® – Operating Parameters

Range	Model		Flowrate at nominal speed range (theoretical)**	Speed (nominal) recommended range	Flowrate at max. speed (theoretical)**	Speed max.
			appr. m³/h	rpm	m³/h	rpm
T2	08/8		1 to 7,6	100 to 500	10,5	800
T2	06/12		2 to 11	100 to 500	17	800
T1	MB-1		3 to 14	100 to 500	23	800
T1	MB-2		4 to 20	100 to 500	32	800
T2	04/45	08/45	8 to 39	100 to 500	46	600
T2	08/45		8 to 39	100 to 500	46	600
T2	03/70	06/70	12 to 58	100 to 500	70	600
T2	06/70		12 to 58	100 to 500	70	600
T2	04/100	08/100	16 to 82	100 to 500	99	600
T2	08/100		16 to 82	100 to 500	99	600
T2	08/200		41 to 161	150 to 500	200	600
T2	03/140	06/140	24 to 119	100 to 500	142	600
T2	06/140		24 to 119	100 to 500	142	600
T2	06/300		60 to 226	150 to 500	300	600
T1	XLB-2		30 to 151	100 to 500	166	550
T2	04/200	08/200	41 to 161	150 to 500	200	600
T1	XLB-3		43 to 214	100 to 500	235	550
T2	03/300	06/300	50 to 240	100 to 500	300	550
T1	XLB-4		60 to 302	100 to 500	332	550
T1	XLB-6/2		121 to 604	100 to 500	604	500
T1	XLB-8/2		181 to 905	100 to 500	905	500

* Temperature, depending on elastomer: 100° C, custom-made: 140° C

** Each flow rate can generally be covered with the conventional TORNADO® T1, too.

PROCESS INDUSTRY

Discharge pressure (max.) continuous/intermitted		Displacement (theoretical)	Flange connections	Pump head materials (wetted)
bar		l/r	mm/ANSI	material
8/10		0,23	32/1,5"	all metall
6/8		0,35	50/2"	all metall
6/8		0,47	65/2,5"	metal/elastomere*
6/8		0,67	80/3"	metal/elastomere*
4/6	8/10	1,27	80/3"	metal/elastomere*
8/10		1,27	80/3"	all metall
3/5	6/8	1,90	100/4"	metal/elastomere*
6/8		1,90	100/4"	all metall
4/6	8/10	2,74	125/5"	metal/elastomere*
8/10		2,74	125/5"	all metall
8		5,72	150/6"	metal/elastomere*
3/5	6/8	3,95	125/5"	metal/elastomere*
6/8		3,95	125/5"	all metall
6		7,95	200/8"	metal/elastomere*
4/6		5,03	150/6"	metal/elastomere*
4/6	8/10	5,07	150/6"	metal/elastomere*
4/6		7,12	150/6"	metal/elastomere*
3/5	6/8	7,95	200/8"	metal/elastomere*
4/6		10,06	200/8"	metal/elastomere*
4/5		20,12	250/10"	metal/elastomere*
3/5		30,18	250/10"	metal/elastomere*

TORNADO® T.Sano®

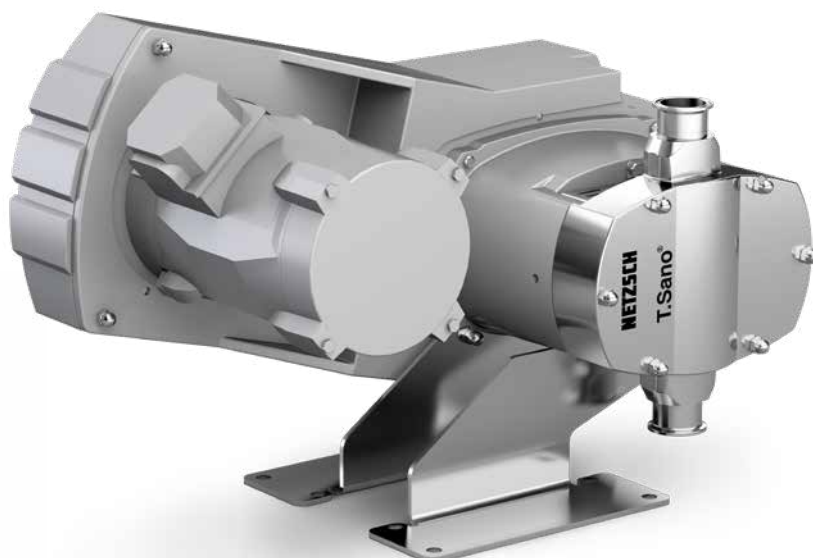
UNCOMPROMISING HYGIENE IN FOOD AND

NETZSCH TORNADO® Rotary Lobe Pumps T.Sano® – Operating Parameters

Range	Model	Flowrate at nominal speed range (theoretical)	Speed (nominal) recommended range	Flowrate at max. speed (theoretical)	Speed max.
		appr. m³/h	rpm	m³/h	rpm
T2*	08/8	0,5 to 7	100 to 300	10,5	800
T2*	06/12	2 to 11	100 to 500	16,5	800
T2	08/45	8 to 39	100 to 500	46	600
T2	06/70	12 to 58	100 to 500	70	600
T2	08/100	16 to 82	100 to 500	99	600
T2	06/140	24 to 119	100 to 500	142	600

* available in smooth surface design: T.Sano® Smooth

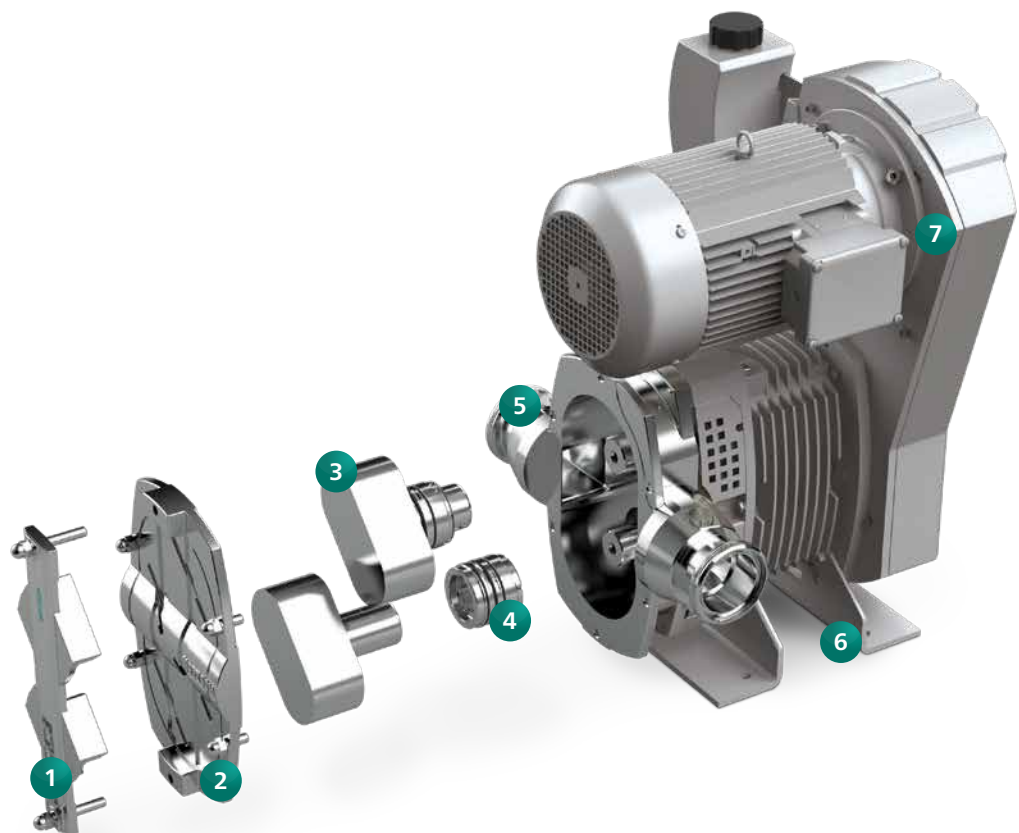
** Temperature depending on the sealing material: 150 °C




COSMETICS INDUSTRY

Discharge pressure (max.) continuous/ intermitted	Displacement (theoretical)	Connections	Pump head materials (wetted)	Surface quality (product-contacted surfaces)
bar	l/r	mm	material	Ra
8	0,23	32	all metal**	0,8
6	0,35	50	all metal**	0,8
8/10	1,27	80	all metal**	0,8
6/8	1,90	100	all metal**	0,8
8/10	2,74	125	all metal**	0,8
6/8	3,95	125	all metal**	0,8

- 1 Rotor setting device
- 2 Front cover
- 3 Rotor
- 4 Seal
- 5 Rotor case
- 6 Bearing housing
- 7 Tooth belt drive





The NETZSCH Group is a mid-sized, family-owned German company engaging in the manufacture of machinery and instrumentation with worldwide production, sales, and service branches.

The three Business Units – Analyzing & Testing, Grinding & Dispersing and Pumps & Systems – provide tailored solutions for highest-level needs. Over 3,500 employees at 210 sales and production centers in 35 countries across the globe guarantee that expert service is never far from our customers.

The NETZSCH Business Unit Pumps & Systems offers with NEMO® progressing cavity pumps, TORNADO® rotary lobe pumps, NOTOS® multi screw pumps, macerators/grinders, dosing technology and equipment custom built and challenging solutions for different applications on a global basis.

Proven Excellence.■

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